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**Transportation**

**AUTOMOTIVE ENGINE OIL ANALYSIS  
PROGRAM**

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This AETCMAN implements AFD 24-3, *Operation, Maintenance, and Use of Transportation Vehicles and Equipment* and adds to procedures in AFMAN 24-307, *Procedures For Vehicle Maintenance Management*. It provides guidance and procedures to vehicle maintenance managers to optionally extend engine oil and filter change intervals through oil analysis. Used engine oil comprises the bulk of waste products emanating from a vehicle maintenance flight. It is strongly recommended maintenance managers become well acquainted with all information presented herein before implementing their oil analysis program. Deviations from procedures described in this manual are prohibited without written approval from HQ AETC/LGTV. Direct all recommendations to improve or change material in this manual to HQ AETC/LGTV. Written approval from HQ AETC/LGTV must be obtained prior to implementation of this program. This publication does not apply to Air National Guard (ANG) and Air Force Reserve Command (AFRC) units. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

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### ***Section A—Background***

**1. Overview .** Oil analysis is an optional program with an analytical approach for monitoring oil contamination and preventing unnecessary oil changes by determining oil replacement requirements based on the oil's actual condition. Recent advances in low cost in-house oil analysis equipment allow reliable analysis within the vehicle maintenance unit. Additionally, high-density bypass filtration is available to extend the oil's useful life as well as extending the life expectancy of the equipment. This program provides guidance on incorporating oil analysis and the use of bypass filters into a unit level vehicle maintenance operation. Success of the program relies heavily on wing leadership and community support.

- 1.1. An oil analysis program can help reduce waste oil generation, purchase of new motor oil, labor hours for waste oil management, and risks involved with the storage, pumping, and shipment of waste

oil. While oil analysis can provide the added benefit of early indication of internal engine wear, engine wear analysis is not the intent of this program and should not be used as a sole determinant in making repair decisions.

1.2. Moving from time/mileage to analysis based oil change intervals and the use of bypass filtration is a challenging undertaking. However, after the implementation of this program, maintenance man-hours required to maintain the lubrication systems of fleets should be reduced.

1.3. When considering the implementation of the oil analysis program, units also have the option to consider only a portion of their fleets. Give consideration to targeting high value, heavy equipment with large sumps, which produce large quantities of waste oil.

1.4. Consider the application of bypass filters on high to medium use vehicles. Due to low annual mileage or hours, low use vehicles may not be cost effective to retrofit with bypass filters.

**2. About Oil.** Oil does more than lubricate; it cools and cleans the engine, prevents corrosion, and reduces friction. Refiners blend in various additives, accounting for 10 to 25 percent of the oil product, to include antioxidants, viscosity-index enhancers, detergents, dispersants, corrosion inhibitors, pour-point depressants, foam inhibitors, and friction modifiers. Additives begin to deplete as oil is used, and eventually stop performing their designed function. When this happens, contaminants will accelerate engine wear. Changing oil removes contamination and replenishes the sump with additive rich lubricant. **NOTE:** Executive Order 13101 mandates use of re-refined oil.

**3. Analyzers.** Vehicle maintenance units must use analyzers recommended by the Management Equipment Evaluation Program (MEEP). A list of MEEP recommended equipment is provided at [Attachment 2](#). When practical, a commercial oil analysis laboratory may be used in lieu of in-house analysis. Ensure commercial laboratories are ISO 9002 certified. ISO 9002, titled Quality Systems, is awarded to companies meeting and maintaining a strict series of quality-assurance guidelines. Once awarded, this seal must continually be recertified through semiannual inspection.

**4. Bypass Filters.** Bypass filters are not required to run an oil analysis program. However, their use may significantly extend oil drain intervals for most vehicles and is recommended for AETC bases undertaking an oil analysis program (pending funding limitations).

4.1. A bypass oil filtration system is one which provides high-density, slow filtration (one to six quarts per minute at engine operating temperature) of engine oil that augments the primary original equipment manufacture (OEM) filtration system. It removes solid contaminants down to three microns (one micron measures 1/39 millionth of an inch), controls moisture content, is compatible with all MIL-SPEC oils, and must specifically claim to extend oil drain intervals.

4.2. It may not be feasible to install bypass filters on all vehicles in a fleet due to the climate in which the vehicle is used, duration of engine run time at operating temperature, and age of the vehicle. In typically warm weather climates (where 15W40 can be used year round) all vehicles benefit from additional filtration because flow through the filter starts almost immediately. However, in colder climates engines must run at normal operating temperature for at least ten minutes to reduce the oil's viscosity for flow through the bypass filter.

4.3. Managers also need to consider a vehicle's age when determining whether to install a bypass filter. Vehicles in replacement codes "A" through "J" typically will not remain in service long enough to

justify the expense of a bypass filter. However, if these vehicles in replacement codes "A" through "J" are in a high to medium use operation or are high value, heavy equipment with large oil sumps, which produce large quantities of waste oil, consider retrofitting this type of equipment.

4.4. The bypass filter is a "one time purchase" therefore, as this older equipment is traded; the bypass filter is removed and installed on the new replacement equipment. Units desiring to purchase a significant number of bypass filter assemblies should consider a lease-to-buy option to defray the heavy initial cost.

**5. Oil Sampling.** Method, equipment, and personnel used to collect oil samples are critical aspects of the analysis program. Oil temperature, location on the engine where the sample is obtained, cleanliness of sampling equipment, amount taken, extraction procedure, and the weather are major factors in determining accuracy of the analysis process.

5.1. Improper sampling techniques will skew analysis results causing unnecessary oil changes. Purity of crankcase oil is an absolute necessity if oil analysis is to be successful. Using only one brand of engine oil throughout the fleet (re-refined 15W40, MIL-SPEC 2104D, meets most vehicle manufacturer requirements for lubrication) is an excellent means of ensuring purity of crankcase oil.

5.2. Other methods to ensure purity of crankcase oil include placing tags on oil filler caps identifying the type of oil in use, and establishing an aggressive education campaign to inform operators of the importance of using the correct engine oil.

5.3. Generally, when taking samples for analysis by a commercial lab or the CSI 5100 Oil View, there are two methods in obtaining an engine oil sample. Installing a petcock to an oil pressure port or by using a suction device through an access port (dip stick or filler tube). If collecting a sample for analysis by the Lubri Sensor or GCF Model 126 portable oil analyzer, simply use the reusable suction tube device that comes with the instrument. If using a suction tube to sample from the sump, do not let it touch the bottom. Always take samples when oil is warm to ensure contaminants are suspended, which is critical to obtaining valid analysis. Additionally, sample bottles must be kept clean to avoid cross-contamination of oil samples.

**6. Oil Analysis Interval.** Analysis works best when intervals are based on the following three criteria; fuel consumption, established scheduled maintenance interval, and/or every six months. Used together, these three intervals provide the most accurate, least laborious, and safest method of ensuring oil contamination does not reach an unacceptable level.

6.1. Fuel consumption is the most effective means in determining when to analyze engine oil. This criteria tracks engine operation irregardless of vehicle use. Oil analysis must be accomplished every 300 gallons of diesel and gasoline used. This indicator was established to simplify the tracking process. It employs a sufficient margin of safety ensuring both types of engines receive adequate analysis before high levels of contamination accumulate in the oil. However, accurate fuel accounting by individual vehicle is essential to ensure adequate analysis of each vehicle's engine oil. [Attachment 3](#) provides instruction and guidance in obtaining the oil analysis fuel retrieval program. Another benefit to fuel monitoring, not connected with the analysis program, is vehicle usage. Fuel use reflects vehicle usage, regardless of mileage or hours accumulated.

6.2. The scheduled maintenance interval is a convenient backup to the fuel consumption interval. Because the vehicle is already in the shop for maintenance, it's easy to ensure the oil is in satisfactory condition.

6.3. The second backup to the fuel consumption interval is the 6 month interval. If the vehicle's oil was not analyzed during the previous six months, as a result of fuel or scheduled maintenance, then the oil is analyzed to ensure it's in satisfactory condition.

**7. Program Support.** Wing leadership support is a key element in getting the program off the ground and maintaining integrity. It requires the cooperation of all vehicle users and vehicle maintenance to be credible and successful.

**8. Instructions.** Vehicle maintenance managers will develop a maintenance operating instruction ([Attachment 4](#)) detailing the operation of their oil analysis program to ensure continuity and standardization. We recommend locating the analysis equipment in the customer support center. At this location, oil will be analyzed while the vehicle is being processed for maintenance and any required servicing of engine oil will be documented on the work order prior to its transfer to the repair shop, streamlining the maintenance process. Oil analysis measurements will include as a minimum the principle characteristics of oil quality that include viscosity, pH/conductivity, particulate contamination, ferrous metal contamination, and water contamination. Affix measured readings to the vehicle work order and maintain until the work order is removed from file.

**9. Servicing Engine Oil.** Operator servicing of the engine oil presents the greatest potential for crank-case contamination. Local managers must be aggressive in their efforts to minimize all possibilities of engine oil contamination. One method to help prevent accidental contamination of engine oil is by placing oil identification tags on engine oil filler caps identifying the type of oil to use. The best approach, although it will require extra manpower and additional O&M cost, is to implement procedures where vehicles are brought to the maintenance facility when oil levels need to be topped off.

**10. On-Line Vehicle Interactive Management System (OLVIMS).** The program's data collection and analysis scheduling relies significantly on several OLVIMS systems codes to be effective. Once the program is initiated, all engine oil changes must be documented on the work order using system code 01HV. Document oil analysis using a new OLVIMS system code, 01HX. This is needed for accurate tracking of intervals. Document bypass filter installations using OLVIMS system code 01HM. Use 01HL to record bypass filter element replacements.

**11. Vehicle Warranty.** New vehicles will be serviced in accordance with the OEM and or Technical Order (TO) 36-1-191 guidelines until the warranty period terminates. After the warranty period terminates, units may consider implementation of the oil analysis program.

### ***Section B—Oil Analysis Program***

**12. Insight.** The first priority when accomplishing any major change in procedure is to start without a backlog. The best method to implement this program is to establish a cross-functional process action team (PAT) to manage and oversee its implementation. Recommend several members of the PAT be comprised of representatives from base units serviced by the vehicle maintenance flight. Outside organizations represent your customer's concerns and will assist in getting buy-in from these units.

### 13. Initial Actions:

13.1. Determine equipment to be used. Obtain sampling bottles using NSN 6640-00-165-5778. The use of bypass filters is not mandatory with this program. If bypass filters are installed, adherence to manufacturer's guidance on filter size and installation procedures is essential to obtain maximum benefit from these devices ([Attachment 2](#)).

13.2. Brief wing leadership and gain their support. Brief the program at vehicle control officer/non-commissioned officer (VCO/VCNCO) meetings and use base resources to publicize. Explain the benefits of the program and ensure there is an understanding of the need for accurate fuel accountability for each vehicle and proper servicing of engine oil by vehicle users. Another important step not to be overlooked is informing the base populous and gaining their support. Program effectiveness and accuracy will diminish without the support of the vehicle user, regardless of how efficiently the analysis program operates. Articles in local papers and daily bulletins, newsletters, briefing first level supervisors and workers at their staff meetings, and one-on-one discussions with vehicle users are effective methods of getting the word out about the program.

13.3. Start your information campaign well in advance of starting the analysis program. This allows the analysis concept to take root and provides a practice period for users to become familiar with the new requirements (fuel accountability, servicing of engine oil, etc.).

13.4. Establish funding requirements. The analysis equipment and bypass filters may qualify for Pollution Prevention Program (PPP) funding for their initial purchase. Total funding for an average size fleet (650 vehicles) can run very high depending on the number of analyzers and bypass filters purchased. Phasing the purchase of equipment over several fiscal years will make it easier for wing leadership to include the program in their annual PPP funding bogey. Ensure analyzers planned for purchase are programmed in the first year's funding for the oil analysis program. Extending the purchase process for bypass filters prevents overwhelming the maintenance shop with filter installations.

13.5. Training. When formal training is required, manufacturers of oil analyzers often provide necessary training at no additional cost to equipment purchasers. Try to schedule training so the analyzers are on station when training is complete, allowing trained personnel to practice their newly acquired skills.

### 14. Startup:

14.1. The analyzer must be properly configured before oil analysis can begin. Follow the manufacturer's procedures for set-up and start-up of analyzer. On the 5100 OilView, move to the alarm limit adjustment screen and adjust the limits ([Attachment 5](#)). After the alarm limits are set, establish a "Reference Oil" for every brand of engine oil used in the fleet. Upon completion of training, setting of alarm limits, and establishment of all reference oils, the analyzer is ready to use. Calibration of the Lubri-Sensor requires zeroing deviation needle using a clean sample of oil to be analyzed each time before use.

14.2. Start the analysis process through gradual application or immediate application. Both have benefits and drawbacks and the one used will depend on the circumstances surrounding your maintenance organization.

**14.2.1. Gradual Application.** Benefits include less disruption of the maintenance environment and little or no overtime. Disadvantages include delayed realization of return on investment and

non-standard oil change interval criteria during the phase-in period. Procedures for gradual application are as follows:

14.2.1.1. When vehicles reach their scheduled maintenance interval, analyze a sample of the oil to determine condition. If required, change the oil and OEM filter based on analysis results. Regardless whether the oil is changed or not, change the OEM filter if an annual inspection is being accomplished in conjunction with the scheduled inspection. Use OLVIMS system code 01HX on an "F" prefix work order to record oil analysis. Document analysis on the scheduled maintenance work order.

14.2.1.2. If you plan to install a bypass filter and it is available, install it now. Compliance with manufacturer's installation instructions is essential to ensure proper operation of the filter assembly.

**14.2.2. Immediate Application.** As the name implies, the entire fleet moves to analysis based intervals at one time. The benefits include a quicker payback on investment and standardization of maintenance procedures. Disadvantages include significant disruption of the maintenance workload until the Oil Analysis Program (OAP) becomes routine for assigned technicians. The following paragraphs describe procedures for immediate application of an oil analysis program.

14.2.2.1. Retrieve from OLVIMS all fuel consumption and last scheduled maintenance data from the previous twelve months for all vehicles. Calculate each vehicle's fuel consumption starting from the most recent scheduled maintenance where the oil was changed.

14.2.2.2. All vehicles with fuel consumption exceeding 300 gallons since the last oil change must have their oil analyzed immediately to determine condition. Change the oil and OEM filter based on analysis results. Use OLVIMS system code "01HX" on an "F" prefix work order to record oil analysis.

14.2.2.3. Calculate the number of days elapsed based on the date of the last oil change. Immediately analyze the oil on all vehicles that have not had an oil change in the last 180 days and are not due analysis as a result of fuel consumption. Record the analysis results in the same manner as described in paragraph 14.2.2.2. Use OLVIMS system code "01HX" on an "F" prefix work order to record oil analysis.

14.2.2.4. Schedule vehicles for maintenance as bypass filters become available for installation. Complying with manufacturer's installation instructions is essential to ensure proper operation of the filter assembly.

## 15. Maintaining the Program:

15.1. As the program moves into the operational phase, vigilance in fuel consumption tracking, oil replenishment, analysis procedures, and oil sampling techniques all take on a heightened level of importance as these factors drive the accuracy of the entire oil analysis program.

15.1.1. Fuel consumption is tracked by computing the amount of fuel charged to the vehicle starting from the date of the last oil analysis action (system code 01HX) to the present day ([Attachment 3](#)). The source of this data originates from the Materiel Transaction Listing (D22), which provides a record of fuel consumption. When the vehicle's fuel consumption exceeds 300 gallons since the last oil analysis, an oil sample must be obtained and analyzed to determine its condition.



Vehicle maintenance organizations must calculate fuel consumption weekly to effectively monitor each vehicle's oil condition.

15.1.2. Analyze the oil in each vehicle every 300 gallons of fuel used, during all scheduled maintenance actions (OLVIMS System code 34AA), and if the oil has not been analyzed within the past 6 months as a result of fuel use or scheduled maintenance. The oil analysis fuel retrieval program will also identify vehicles meeting the six-month interval criteria.

15.1.3. Original equipment oil filters must be changed when oil is replaced and during the vehicles' annual inspection. The original equipment filter must not be allowed to remain on the vehicle longer than one year. These filters are not intended for extended use.

15.1.4. Use OLVIMS system code 01HX on vehicle work orders to document oil analysis. Use 01HL when analysis dictates changing only the bypass filter element. Use OLVIMS system code 01HV when changing the engine oil.

15.2. When preparing vehicles for temporary duty (TDY) 30 days or more, the vehicle maintenance manager (VMM) will make determination as to oil and filter elements replacement based on engine oil test results, date of last oil change, location and length of TDY, and maintenance capabilities at the TDY location prior to shipment. Bypass filters will remain on the vehicle and be documented as such in the remarks section of the outgoing limited technical inspections (LTI). Vehicles returning from a 30 day TDY will have the oil tested and oil and bypass/OEM filter elements replaced, if needed, prior to being released from vehicle maintenance.

15.3. Vehicles approved for salvage will normally have bypass filter assemblies and accessories removed from the vehicle prior to transfer to Defense Reutilization and Marketing Office (DRMO). Be sure to cap all oil ports left open. Attach a serviceability tag to the bypass filter assembly and store as work order residue until installed on another vehicle.

15.4. Vehicle transfers. Vehicles permanently transferred to another installation will have the oil and all OEM filters changed and any installed bypass filter assemblies removed. Cap all oil ports left open. Attach a serviceability tag to the bypass filter assembly and store as work order residue until installed on another vehicle.

15.5. Servicing oil bypass filter elements will be added as concurrent inspections to scheduled maintenance for vehicles so equipped.

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Deputy Director of Logistics

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFPD 24-3, *Operation, Maintenance, and Use of Transportation Vehicles and Equipment*

AFMAN 24-307, *Procedures For Vehicle Maintenance Management*.

***Abbreviations and Acronyms***

**DRMO**—Defense Reutilization and Marketing Office

**LTI**—limited technical inspections

**MEEP**—Management Equipment Evaluation Program

**OAP**—Oil Analysis Program

**OEM**—Original Equipment Manufacture

**OLVIMS**—On-Line Vehicle Interactive Management System

**PAT**—process action team

**PPP**—Pollution Prevention Program

**TDY**—temporary duty

**TO**—technical order

**VMM**—Vehicle Maintenance Manager

**VCO/VCNCO**—Vehicle Control Officer/Noncommissioned Officer



**Attachment 2**

**OIL ANALYSIS EQUIPMENT REFERENCE**

**A2.1.** The following is provided to assist vehicle maintenance flights in purchasing their oil analyzer.

A2.1.1. CSI (5100 OilView and 51DV analyzers)

Computational Systems Incorporated

Phone (423) 675-2110

[www.compsys.com](http://www.compsys.com)

NSN: 6650-01-408-3269

A2.1.2. Lubri Sensor (NI-2B)

Northern Technologies International Corp

Phone 1-800-328-2433 ext. 216 or (651) 784-1250

[www.ntic.com](http://www.ntic.com)

NSN: 6630-01-420-9448

**A2.2.** The following is a list of accepted bypass filters supporting this program.

A2.2.1. ENVIRO FILTRATION

Phone: 1-800-368-4763 or (219)884-7963

One filter element services all size systems by stacking the appropriate number of elements.

A2.2.2. GULF COAST FILTERS

Phone: 1-800-398-8114 or (228)832-1663

Filter elements use off-the-shelf toilet and paper towel rolls.

A2.2.3. OIL GUARD

Phone: 1-800-671-0777

Spin-on cotton/cellulose element.

A2.2.4. T.F. PURIFINER

Phone: 1-800-488-0577 or (561)547-9499

Electric heating element converts water content and fuel dilution to vapor which is vented to the air filter.

**Attachment 3****OIL ANALYSIS FUEL RETRIEVAL PROGRAM**

The oil analysis fuel retrieval program was included for use in Update 18 of the On-Line Vehicle Interactive Management System.

**A3.1.** Program should be run in conjunction with the routine, weekly run scheduled maintenance.

**A3.2.** The program may only be accessed from the MSDOS prompt.

From the C:> type CD\OLVIMS\SYSTEM and press enter.

Type NVQEXE NVQTOL ? (? = Site Code) and press enter.

The program will look for vehicles that have used 300 gallons of fuel and create a list of vehicles due for inspection.

**Attachment 4****SAMPLE MAINTENANCE OPERATING INSTRUCTION****DEPARTMENT OF THE AIR FORCE****LGTM OI 24-XX**

(XXXX) Transportation Squadron

Vehicle Maintenance Flight

Regional AFB, USA 12345

(Date)

Motor Vehicles

**OIL ANALYSIS PROGRAM (OAP)**

**PURPOSE AND SCOPE:** This instruction establishes responsibilities, methods and procedures for the operation and maintenance of an oil analysis program within this vehicle maintenance flight. Oil analysis is an analytical approach in determining contamination of automotive engine oil. Use of analysis and bypass filters significantly reduces this flight's generation of waste oil and the purchase of new oil. This instruction applies to all personnel assigned to the vehicle maintenance flight. Deviations from procedure herein are prohibited without prior approval from the Vehicle Maintenance Manager/Superintendent (VMM/VMS).

**1. RESPONSIBILITIES:**

1.1. The VMM/VMS has overall responsibility for policy, procedure, and management of the OAP.

1.2. The NCOIC of Customer Service Center (CSC) is responsible for the daily operation and maintenance of the OAP within vehicle maintenance. This includes but is not limited to the following:

1.2.1. Initiate and enforce all policy and procedures set forth by the VMM/VMS on the operation and maintenance of the OAP.

1.2.2. Ensure the security and serviceability of all equipment used in the OAP.

1.2.3. Ensure all OAP equipment is operated IAW manufacturer's specifications.

1.2.4. Ensure all personnel assigned to perform oil analysis functions are fully trained in proper oil analysis procedures, operation of analysis equipment, and maintenance of equipment.

1.2.5. Develop lesson plans to standardize training in oil analysis procedures.

1.2.6. Develop and maintain a continuity book to establish a record of corporate knowledge of the OAP.

1.2.7. MC&A will track the oil analysis interval using the OAP fuel retrieval program.

## **2. METHODS:**

2.1. Oil Sampling: Oil samples will be taken via an installed petcock or by a suction device using the "free catch" method obtaining 75ml (three-quarters full of sample bottle NSN 6640001655778) of engine oil. If a bypass filter is installed, the samples can be obtained by using the petcock installed on the inlet side of the bypass filter.

2.2. Analysis: Accomplish all oil analysis using a MEEP approved analyzer or a local laboratory. Save analysis results.

2.3. Oil change interval: Analysis interval is based on the following three criteria; fuel consumption, established scheduled maintenance interval, and/or every six months. Used in concert, these three interval criteria provide the most accurate, least laborious, and safest method of ensuring the oil's lubricity remains at an optimum level.

2.4. Use OLVIMS system code 01HX on an "F" prefix vehicle work order to document oil analysis. Use 01HL on work orders to document bypass filter element replacement. Use OLVIMS system code 01HV on work orders to document changing the engine oil.

## **3. PROCEDURES**

3.1. Oil sampling: All oil samples will be drawn only when the engine has been operating at manufacture's operating temperature for at least 10 minutes. Normally, all vehicles requiring an oil sample will be brought to the shop to have the sample drawn. Only those vehicles where it would not be practical (tracked vehicles, large construction equipment, etc.) to bring them to the shop for oil sampling will have their sample drawn in the field. Personnel will make every effort to prevent spillage during the entire sampling process. Sample bottles will be marked with vehicle registration number, date sample taken, and

odometer reading or hour reading. Use a new sample bottle for every oil sample drawn. Do not clean and reuse sampling bottles.

3.2. Analysis: Each sample bottle must be three-quarters full of oil and the oil at room temperature to ensure consistency of analysis results. Dispose of oil sample as waste oil after analysis is completed.

3.3. Analysis Interval: MC&A and the NCOIC of CSC will coordinate their efforts in scheduling vehicles into the shop for analysis. MC&A will provide the NCOIC of CSC a list of vehicles needing analysis for the week. MC&A will acquire this list by running the oil analysis interval program. Additionally, MC&A will provide a separate list to each outlying work center. Each outlying work center will coordinate with the units they support to obtain the necessary oil samples. Oil samples will be brought to CSC for analysis.

3.3.1. Analyze engine oil at 300-gallon intervals of fuel consumption for each vehicle. Fuel consumption is tracked by computing the amount of fuel charged to the vehicle starting from the date of the last oil analysis action (system code 01HX) to the present day.

3.3.2. Analyze a vehicle's engine oil during every scheduled maintenance action (35AA).

3.3.3. Analyze a vehicle's engine oil if it has not been analyzed in the previous six months as a result of fuel consumption or scheduled maintenance. The oil analysis fuel retrieval program will identify these vehicles.

3.3.4. Vehicles with two engines: Vehicles with two engines will always have oil from both engines analyzed simultaneously. At no time will one engine's oil receive analysis without the other receiving the same analysis. No additional documentation is necessary on the vehicle work order other than the standard 01HX system code. However, the second engine analysis must be tracked separately.

3.3.5. When preparing vehicles for TDY 30 days or more, VMM will make determination as to oil and filter elements replacement based on engine oil test results, date of last oil change, location and length of TDY, and maintenance capabilities at the TDY location prior to shipment. Bypass filters will remain on the vehicle and be documented as such in the remark section of the out going LTI. Vehicles returning from a 30 day TDY will have the oil tested and oil and bypass/OEM filter elements replaced, if needed, prior to being released from vehicle maintenance.

3.3.6. Vehicles, which are transferred into the fleet from other bases, will have their oil changed unless the oil type can be confirmed by contacting the previous base. If the oil type is confirmed and is the same used in our shop, then analyze the oil during the acceptance inspection and follow normal procedure based on analysis results.

3.3.7. Engine oil 15W40 (MIL-SPEC 2104D) will be the **ONLY** oil used in vehicle engine crankcases for the entire fleet to reduce the possibility of mixing viscosity rated oils in the same engine.

3.3.8. Vehicles being permanently transferred to another installation (RDO action) will have all bypass filter assemblies removed, all OEM filters replaced, and the engine oil replaced prior to shipment.

3.3.9. Vehicles approved for salvage must have all bypass filter assemblies removed prior to transfer to DRMO.

(Example)

ERNEST P. RICKETTS, CMSgt, USAF

Vehicle Maintenance Manager

## Attachment 5

**OILVIEW ALARM LIMITS FOR PETROLEUM AND SYNTHETIC ENGINE OIL****A5.1. Petroleum Based Engine Oil (Gas and Diesel Engines).**

<b><u>TYPE:</u></b>	<b><u>GOOD</u></b>	<b><u>FAIR</u></b>	<b><u>MARGINAL</u></b>	<b><u>BAD</u></b>	<b><u>EXTREME</u></b>
Oil life	9	11	13	16	20
Corrosion	5	7	9	12	16
Contaminants	7	7	11	13	17
Ferrous	1	3	5	7	11
Viscosity	10	10	20	25	30

**A5.2. Synthetic Based Engine Oil.**

## A5.2.1. Gas Engine

<b><u>TYPE:</u></b>	<b><u>GOOD</u></b>	<b><u>FAIR</u></b>	<b><u>MARGINAL</u></b>	<b><u>BAD</u></b>	<b><u>EXTREME</u></b>
Oil life	4	8	11	15	28
Corrosion	3	6	8	12	19
Contaminants	3	6	10	14	13
Ferrous	2	4	5	7	8
Viscosity	5	10	15	20	30

## A5.2.2. Diesel Engine

<b><u>TYPE:</u></b>	<b><u>GOOD</u></b>	<b><u>FAIR</u></b>	<b><u>MARGINAL</u></b>	<b><u>BAD</u></b>	<b><u>EXTREME</u></b>
Oil life	4	8	13	18	30
Corrosion	2	4	5	7	15
Contaminants	4	8	12	18	24
Ferrous	3	6	10	20	27
Viscosity	5	10	15	20	30

**NOTE:** Do not adjust other alarm limits not identified on this list. OilView software version 1.43 does not allow adjustment of the alarm limits for the "Good" and "Fair" indicators. However, continue to realign the "Marginal," "Bad," and "Extreme" limits as depicted.